DRISI

Caltrans Division of Research, Innovation and System Information

Research Results

Improving Safety Detection Methods to Identify High-Collision Locations

Expanding the conventional safety performance functions for roadway segments, intersections, and ramps more accurately identifies sites with safety problems to prioritize improvements

Transportation Safety and Mobility

FEBRUARY 2016

Project Title:
Methods for Identifying High Collision Concentrations for Identifying Potential Safety Improvements

Task Number: 2317

Start Date: February 1, 2013

Completion Date: January 31, 2015

Product Category: New or improved decision support tool, simulation, model, or algorithm (software)

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WHAT WAS THE NEED?

Identifying sites that require safety improvements must be accurate, otherwise scarce resources are wasted on sites incorrectly classified as high-collision areas, while locations that would benefit from safety improvements might not be flagged. Collisions alone are not adequate predictors of safety risk areas. Other factors, such as facility type, roadway geometry, and traffic volumes, play important roles in determining if a location has a safety problem. These factors need to be incorporated into safety performance equations to help Caltrans assess its entire network and spend on improvements efficiently and effectively.

WHAT WAS OUR GOAL?

The goal was to develop safety performance functions for roadway segments, intersections, and ramps to improve the method of detecting high-collision concentration locations.

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Caltrans provides a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

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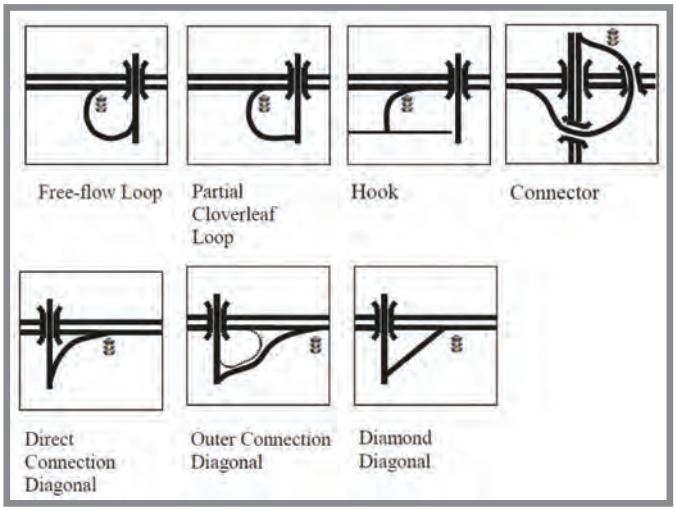
WHAT DID WE DO?

Caltrans, in partnership with the University of California, Berkeley Institute of Transportation Studies, developed safety performance functions (SPF) for roadway segments, intersections, and ramps on the entire Caltrans network using historical crash and geometric data from 2005–10. To develop the SPFs, the state network was scanned for complete geometric and traffic volume data. Over 13,000 centerline miles of road segments, 17,000 intersections, and the entire ramp system with metered subsets were evaluated. The researchers devised two statistical models. Type 1 SPFs use the length of the roadway segment and the average daily traffic as predictors. The type 2 equation addresses roadway geometrics in addition to traffic volume, and in the case of intersections, includes a traffic control parameter. For ramps, the type 2 SPFs incorporate variables for metering, HOV lanes, and the ramp configuration. The SPFs also consider the severity of the incident, such as property damage only, complaint of pain, visible injury, severe injury, and fatality. The researchers conducted model transferability tests to evaluate parameter stability across years.



Ramp metering system configuration types

WHAT WAS THE OUTCOME?

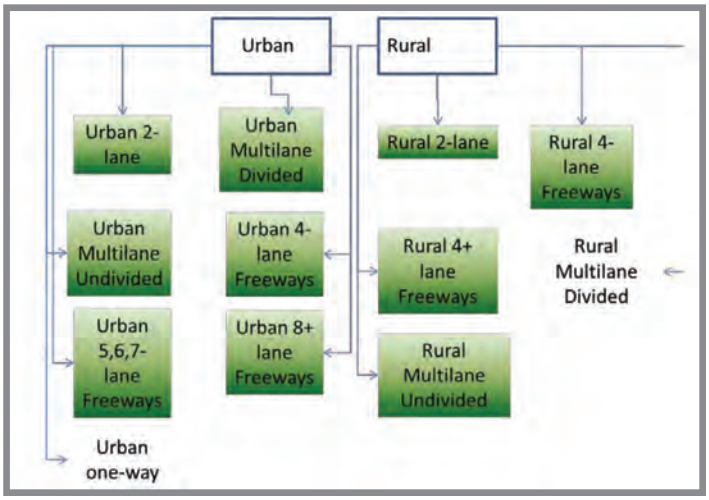
The project developed 60 type 1 SPFs for roadway segments and 60 type 2 SPFs for the five major severity outcomes. For the network's 17,000 intersections, the researchers developed 12 type 1 and type 2 SPFs, and another 12 SPFs for the ramp system. When comparing the type 1 and type 2 SPFs for predictive effectiveness, the research found that the type 2 SPFs provided better measures.

WHAT IS THE BENEFIT?

Safety performance equations are used to identify locations with a high concentration of incidents and dictate how Caltrans allocates funding for safety improvements. To avoid spending money on locations that are not dangerous (false positives) and to ensure that money is spent on locations that would benefit from the investment in safety improvements (false negatives) requires improving the accuracy of SPFs by incorporating site-specific factors beyond just the number of collisions. Caltrans can use the SPFs developed, which provide more predictive capabilities, to prioritize safety improvements and more efficiently target high-collision concentration locations.

LEARN MORE

To view the complete report:
www.dot.ca.gov/research/researchreports/reports/2015/CA15-2317_FinalReport.pdf



Type 1 and type 2 SPF modeling architecture